

*Sub A15*

WE CLAIM:

1. A composition comprising:  
about 0.05 wt-% to about 95.0 wt-% mono-or-diester dicarboxylate,  
about 0.05 wt-% to about 90.0 wt-% hydrogen peroxide, and  
about 10.0 wt-% to about 99.98 wt-% water.

2. The composition of claim 1, comprising  
about 0.1 wt-% to about 50 wt-% mono-or-diester dicarboxylate,  
about 0.1 wt-% to about 25 wt-% hydrogen peroxide, and  
about 20 wt-% to about 99 wt-% water

3. The composition of claim 1, comprising:  
about 0.1 wt-% to about 10 wt-% mono-or-diester dicarboxylate,  
about 0.1 wt-% to about 10 wt-% hydrogen peroxide, and  
about 30 wt-% to about 99 wt-% water.

4. The composition of claim 1, comprising:  
about 50 wt-% mono- or diester dicarboxylate,  
about 25 wt-% hydrogen peroxide, and  
about 25 wt-% water.

5. The composition of claim 1, comprising monomethyl malonate, dimethyl malonate, monoethyl malonate, diethyl malonate, monopropyl malonate, dipropyl malonate, monobutyl malonate, dibutyl malonate, diamyl malonate, dihexyl malonate, di-2-ethylhexyl malonate, monomethyl succinate, dimethyl succinate, monoethyl succinate, diethyl succinate, monopropyl succinate, dipropyl succinate, monobutyl succinate, dibutyl succinate, diamyl succinate, dihexyl succinate, di-2-ethylhexyl succinate, monomethyl glutarate, dimethyl glutarate, monoethyl glutarate, diethyl glutarate, monopropyl glutarate, dipropyl glutarate, monobutyl glutarate, dibutyl glutarate, diamyl glutarate, dihexyl glutarate, di-2-ethylhexyl glutarate, monomethyl adipate, dimethyl adipate, monoethyl adipate, diethyl adipate,

monopropyl adipate, dipropyl adipate, monobutyl adipate, dibutyl adipate, diamyl adipate, dihexyl adipate, di-2-ethylhexyl adipate, monomethyl sebacate, dimethyl sebacate, monoethyl sebacate, diethyl sebacate, monopropyl sebacate, dipropyl sebacate, monobutyl sebacate, dibutyl sebacate, diamyl sebacate, dihexyl sebacate, di-2-ethylhexyl sebacate, or a mixture thereof.

6. The composition of claim 5, comprising dimethyl malonate, diethyl malonate, dipropyl malonate, dibutyl malonate, diamyl malonate, dihexyl malonate, di-2-ethylhexyl malonate, dimethyl succinate, diethyl succinate, dipropyl succinate, dibutyl succinate, diamyl succinate, dihexyl succinate, di-2-ethylhexyl succinate, dimethyl glutarate, diethyl glutarate, dipropyl glutarate, dibutyl glutarate, diamyl glutarate, dihexyl glutarate, di-2-ethylhexyl glutarate, dimethyl adipate, diethyl adipate, dipropyl adipate, dibutyl adipate, diamyl adipate, dihexyl adipate, di-2-ethylhexyl adipate, dimethyl sebacate, diethyl sebacate, dipropyl sebacate, dibutyl sebacate, diamyl sebacate, dihexyl sebacate, di-2-ethylhexyl sebacate, or a mixture thereof.

7. The composition of claim 6, dimethyl oxalate, dimethyl malonate, dimethyl succinate, dimethyl adipate, dimethyl sebacate, diethyl oxalate, diethyl malonate, diethyl succinate, diethyl glutarate, diethyl adipate, diethyl sebacate, dipropyl oxalate, dipropyl malonate, dipropyl succinate, dipropyl glutarate, dipropyl adipate, dipropyl sebacate, dibutyl oxalate, dibutyl malonate, dibutyl succinate, dibutyl glutarate, dibutyl adipate, dibutyl sebacate, diamyl succinate, diamyl sebacate, dihexyl succinate, dihexyl sebacate, diethylhexyl succinate, diethylhexyl sebacate, or a mixture thereof.

8. The composition of claim 1, comprising about 0.05 wt-% to about 50.0 wt-% diester dicarboxylate.

9. The composition of claim 8, comprising about 0.1 wt-% to about 20.0 wt-% diester dicarboxylate.

10. The composition of claim 1, comprising about 0.1 wt-% to about 10.0 wt-% diester dicarboxylate.

11. The composition of claim 1, comprising about 0.05 wt-% to about 50.0 wt-%  
5 hydrogen peroxide.

12. The composition of claim 1, comprising about 0.1 wt-% to about 25.0 wt-% hydrogen peroxide.

10 13. The composition of claim 1, comprising about 0.1 wt-% to about 10.0 wt-% hydrogen peroxide.

14. The composition of claim 1, comprising about 10.0 wt-% to about 99.98 wt-% water.

15 15. The composition of claim 1, comprising about 20.0 wt-% to about 99.0 wt-% water.

16. The composition of claim 1, comprising about 30.0 wt-% to about 99.0 wt-%  
20 water.

17. The composition of claim 1, further comprising a stabilizing agent.

18. The composition of claim 17, wherein the stabilizer comprises  
25 the stabilizer comprises a phosphonic acid, a dipicolinic acid, a picolinic acid, a gluconic acid, a quinolinic acid, an ethylenediamine tetraacetic acid (EDTA), an hydroxyethylethylene diamine triacetic acid (HEDTA), an ethylene triaminepentaacetic acid, a polyacrylic acid, a salt thereof, or a mixture thereof.

30 19. The composition of claim 18, wherein the phosphonate comprises 1-hydroxy ethylidene-1,1-diphosphonic acid ( $\text{CH}_3\text{C}(\text{PO}_3\text{H}_2)_2\text{OH}$ ) (HEDP), amino[tri(methylene

phosphonic acid)] ( $[CH_2PO_3H_2]_2$ (ethylene diamine[tetra methylene-phosphonic acid]), 2-phosphene butane-1,2,4-tricarboxylic acid, an alkali metal salt thereof, an ammonium salt thereof, an alkyloyl amine salt thereof, or a mixture thereof.

5        20.      The composition of claim 19, wherein the alkyloyl amine salt comprises a monoethanol amine salt, a diethanolamine salt, a tetraethanolamine salt, or a mixture thereof.

10        21.      The composition of claim 1, wherein the composition is free of added strong inorganic acid.

15        22.      The composition of claim 1, wherein, when diluted by at least about 1.0-fold, the diluted composition exhibits antimicrobial activity against *Bacillus cereus*, *Bacillus subtilis*, or *Chaetomium funicola* upon contacting the microbe with the composition for at least 5 seconds at 0 °C to 100 °C.

20        23.      The composition of claim 1, wherein, when diluted by at least about 1.0-fold, the diluted composition exhibits at least  $1.0 \log_{10}$  microbial reduction against *Bacillus cereus*, *Bacillus subtilis*, or *Chaetomium funicola* upon contacting the microbe with the composition for at least 5 seconds at 20 °C to 65 °C.

25        24.      A method for making an antimicrobial composition, comprising:  
                adding hydrogen peroxide to a vessel;  
                adding mono- or diester dicarboxylate to a vessel;  
                mixing the hydrogen peroxide and the mono- or diester dicarboxylate in the vessel;  
                retaining the hydrogen peroxide and the mono- or diester dicarboxylate in the vessel  
for a duration of from about 0.05 minutes to no more than about 21 days; and  
                diluting the retained and mixed hydrogen peroxide and mono- or diester dicarboxylate composition to form a use antimicrobial composition.

25. The method of claim 24, further comprising removing a portion of the retained and mixed hydrogen peroxide and mono- or diester dicarboxylate composition from the vessel for diluting.

5 26. The method of claim 24, comprising continuously, or semi-continuously, adding hydrogen peroxide and alternately continuously, or semi-continuously, adding mono- or-diester dicarboxylate to the vessel.

10 27. The method of claim 26 where hydrogen peroxide is added continuously, or semi-continuously, without adding additional mono-or-diester dicarboxylate to the vessel.

15 28. The method of claim 26, further comprising removing a portion of the retained and mixed hydrogen peroxide and mono-or-diester dicarboxylate composition from the vessel for diluting.

29. The method of claim 24, comprising batch wise adding hydrogen peroxide and batch wise adding mono- or diester dicarboxylate to the vessel.

20 30. The method of claim 24, comprising batch wise removing a portion of the retained and mixed hydrogen peroxide and mono- or diester dicarboxylate composition from the vessel for diluting.

25 31. The method of claim 24, comprising:  
adding mono- or diester dicarboxylate and aqueous hydrogen peroxide to achieve a composition comprising:  
about 0.05 wt-% to about 50.0 wt-% mono-or-diester dicarboxylate,  
about 0.05 wt-% to about 50.0 wt-% hydrogen peroxide, and  
about 10.0 wt-% to about 99.98 wt-% water.

30 32. The method of claim 24, comprising:  
achieving a composition comprising:

about 50 wt-% mono- or diester dicarboxylate,  
about 25 wt-% hydrogen peroxide, and  
about 25 wt-% water.

5        33.      A method of reducing population of microorganism on an object, comprising:  
contacting the object with use composition of *in situ* composition;  
the *in situ* composition comprising:

about 0.01 wt-% to about 30.0 wt-% mono- or diester dicarboxylate,  
about 0.01 wt-% to about 30.0 wt-% hydrogen peroxide, and  
about 10.0 wt-% to about 99.98 wt-% water.

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34.      The method of claim 33, further comprising:  
forming the use composition of the *in situ* composition by:  
diluting the *in situ* composition by a factor of 1:1.

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35.      The method of claim 33, wherein the microorganism is a fungus.

36.      The method of claim 33, wherein the microorganism is of the genus  
*Chaetomium*.

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37.      The method of claim 33, wherein the microorganism is of the genus  
*Arthrinium*.

38.      The method of claim 33, wherein the microorganism is of the genus *Bacillus*.

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39.      The method of claim 33, comprising contacting with use composition  
effective to reduce by more than 1-log order the population of spores and/or cells of *Bacillus*  
*cereus* within 10 seconds at 60° C.

40. The method of claim 33, comprising contacting with use composition effective to reduce by more than 1-log order the population of cells of *Chaetomium funicola* within 10 seconds at 60° C.

5 41. The method of claim 33, comprising contacting with use composition  
effective to reduce by more than 1-log order the population of spores and/or cells of  
*Chaetomium funicola* and *Bacillus cereus* within 10 seconds at 60° C.

42. The method of claim 33, comprising contacting hard surface, soft surface,  
10 porous surface, food substance, or skin.

43. The method of claim 33, comprising contacting food, beverage, or pharmaceutical packaging.

15 44. The method of claim 43, comprising contacting aseptic food, beverage, or pharmaceutical packaging.

45. The method of claim 33, comprising contacting all or part of a food, beverage, or pharmaceutical plant.

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46. The method of claim 33, comprising contacting tank, pipe, line, pump, valve,  
or other mixing or fluid transport apparatus.

47. A method for cold aseptic bottling of food, beverages, or pharmaceuticals, the  
25 method comprising:

contacting a beverage container with an use composition of an *in situ* composition for sufficient period of time to reduce the microorganism population;

the *in situ* comprising:

about 0.01 wt-% to about 25.0 wt-% mono- or diester dicarboxylate,

about 0.01 wt-% to about 35.0 wt-% hydrogen peroxide, and

about 10.0 wt-% to about 99.98 wt-% water;

filling the container with a beverage, food, or pharmaceutical;  
sealing the filled container;  
wherein contacting obtains a significantly reduced population of microorganisms  
resulting in a sanitized food, beverage, or pharmaceutical container.

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